# CERTIFICATE OF VERIFICATION

I, Soo Jin KIM of 648-23 Yeoksam-dong, Gangnam-gu, Seoul, Republic of Korea state that the attached document is a true and complete translation to the best of my knowledge of the Korean-English language and that the writings contained in the following pages are correct English translation of the specification and claims of the Korean Patent Application No. 10-1999-0013569.

Dated this 30th day of January, 2007.

Signature of translator: _____

Soo Jin KIM

# KOREAN INTELLECTUAL PROPERTY OFFICE

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Applicant(s) : LG Electronics Inc.

**COMMISIONER**

## [ABSTRACT OF THE DISCLOSURE]

**[ABSTRACT]**

The present invention relates to an apparatus and method for recording/reproducing of optical recording medium for detecting and compensating detrack of an optical recording medium. Since the magnitude of a read channel 2 signal detected from header 1 and 3 field, especially, in VFO1 and VFO3 in header 1 and 2 field is constant and a wobble center is changed according to detrack level, detrack is compensated by detecting the magnitude and direction of the detrack by comparing potential difference between the wobble center and VFO1 signal with potential difference between the wobble center and VFO3 signal, thereby preventing deterioration of data quality caused by detrack during a recording/reproducing operation.

**[TYPICAL DRAWING]**

<tilt, detrack offset, defocus offset>

**[INDEX WORDS]**

detrack

**[SPECIFICATION]**

**[TITLE OF THE INVENTION]**

**METHOD AND APPARATUS FOR RECORDING/REPRODUCING OF OPTICAL RECORDING MEDIUM**

**[BRIEF DESCRIPTION OF THE DRAWINGS]**

FIG. 1 is a diagram showing an arrangement of a header preformatted at the beginning position of each sector in a general rewritable disc.

FIG. 2 is a block diagram showing a structure of an optical disc recording/reproducing apparatus for controlling detrack in accordance with the present invention.

FIG. 3 is an exemplary diagram showing an optical detector of the optical pickup shown in FIG. 2.

FIG. 4 is an exemplary graph showing read channel 2 signals detected at VFO1 and VFO3 areas in the header field depending on variation of a detrack offset.

FIGS. 5a to 5c are exemplary diagrams showing potential difference relationship between read channel 2 signals detected at VFO1 and VFO3 areas in the header field depending on variation of defocus offset and wobble signals.

***Reference numerals of the essential parts in the drawings***

201 : optical disc

202 : optical pickup

203 : error signal generator

204 : detrack detector

205 : servo controller

206 : tracking operator

**[DETAILED DESCRIPTION OF THE INVENTION]**

**[OBJECT OF THE INVENTION]**

**[FIELD OF THE INVENTION AND DISCUSSION OF THE RELATED ART]**

The present invention relates to a high-density optical recording medium system, and more particularly, to an apparatus and method for recording/reproducing of optical recording medium, capable of detecting and compensating for defocus of the optical recording medium.

In general, a repetitively and freely rewritable optical recording medium, for example, an optical disc includes rewritable compact disc (CD-RW) and rewritable digital versatile disc (DVD-RW, DVD-RAM, DVD+RW).

These rewritable optical discs, particularly, DVD-RAMs have signal tracks made up of lands and grooves and enable the tracking control of an empty disc on which no information signal is written. Recently, information signals are also written on the tracks of lands and grooves so as to enhance recording density. For this

purpose, the recent optical pickup for recording and reproducing information signals uses the shorter wavelength of laser beam with an increased number of apertures formed in the object lens and thereby reduces the size of beam for recording/reproducing.

In order to achieve higher recording density, such a rewritable high-density optical disc is designed to have a reduced distance between the signal tracks, i.e., the smaller signal track pitch.

For the rewritable discs, it is naturally impossible to perform a disc control and a recording operation in an empty disc in which no information is written.

Thus disc tracks are formed in lands and grooves to write information on, and control information for random access and rotation control is separately recorded in the disc, so as to enable tracking control in the empty disc.

The control information is, as shown in FIG. 1, written on the header pre-formatted at the beginning position of each sector, or along the track in the wobbling profile.

The term "wobbling" as used herein refers to recording the control information on the boundary of tracks in accord to variation of laser beam by supplying power of laser diodes with information for modulating a

predetermined clock and applying the modulated clock to the disc, e.g., information about a desired position and the rotational speed of the disc.

The header preformatted at the beginning position of each sector includes four header fields (header 1 field, header 2 field, header 3 field and header 4 field). Each header field has variable frequency oscillator (VFO) areas for generating a reference clock to acquire bit synchronization of read channels. In the present invention, the VFO areas present in the respective header fields (header 1 field ~ header 4 field) are called VFO1 ~ VFO4.

That is, VFO1 and VFO 3 areas are present in the header 1 field and the header 3 field, VFO2 and VFO4 areas being in the header 2 field and the header 4 field. The VFO1 and VFO3 areas are longer and more stable for signal detection than the VFO2 and VFO4 areas.

At this time, the four header fields are staggered with respect to each other from the track center. FIG. 1 shows an example of the header for the first sector in a track. Referring to FIG. 1, the track boundary of the user area in which data are actually written has a wobbling profile.

An optical record reproducing apparatus also performs tracking controls with an optical pickup in recording and reproducing information.

That is, tracking control, e.g., tracking servo involves detection of tracking error signals from electrical signals generated in accordance to the beam trace status and driving a tracking actuator in the optical pickup based on the tracking error signals to move an object lens of the optical pickup in the radial direction, thereby changing the position of the beam to track a desired track. There are some cases where detrack occurs that the beam focus is deflected from the track center, even through no tracking error signal is detected. Detrack does not adversely affect the CDs.

However, detrack has an adverse effect on the optical discs such as DVD-RAM where data recording and reproducing is enabled in both lands and grooves, because the track pitch is narrowed for purpose of high densification.

Due to a depth difference between land and grooves, detrack may occur in the tracks of the grooves even when no detrack is detected in the tracks of the lands. Likewise, the tracks of the lands may have detrack while there is no detrack detected in the tracks of the grooves.

**[TECHNICAL TASKS TO BE ACHIEVED BY THE INVENTION]**

Hence, if detrack occurs, recording/reproducing data becomes harder because the beam is ready to shift to

the adjacent track to cause a cross talk and clear data from the track.

Accordingly, the present invention is directed an apparatus and method for recording/reproducing of optical recording medium that substantially obviates one or more problems due to limitations and disadvantages of the related art.

An object of the present invention is to provide an apparatus and method for recording/reproducing of optical recording medium, capable of detecting and compensating for detrack from potential difference between wobble signals recorded in a track and read channel 2 signals detected from VFO1 and VFO3 areas in the header field.

**[SYSTEM AND OPERATION OF THE INVENTION]**

To achieve the above objects of the present invention, when recording/reproducing a disc arranging a plurality of sections being difference in phase for dividing shape of data area between writable data areas in which information for recognizing reference frequency is wobbled on a track and having non-writable areas repetitively/alternately and sequentially including position information of disc of the data area in each section, a method for recording/reproducing of an optical recording medium includes the steps of: detecting a wobble

signal of the data area; obtaining a difference value between the wobble signal and a signal detected from the non-writable area and outputting the resulting value to the 1 differential signal; obtaining a difference value between the wobble signal and a signal detected from a non-writable area having a phase different to the non-writable area; obtaining the 2 differential signal between the 1 differential signals at the above steps; determining as detrack if the differential 2 signal exceeds the prescribed reference value and outputting the resulting the value; and performing a tracking servo from the resulting value.

The step for obtaining the differential signal uses only prescribed part of the non-writable area.

The step for obtaining the differential signal uses VFO area of the non-writable area.

The step for obtaining the differential signal uses read channel 2 signals generated from electrical signals outputted in proportion to quantity of light reflected from the optical recording medium.

The potential of the wobble signal in the step for obtaining the differential signal is center voltage of the wobble signal detected from the read channel 2 signals.

The detrack detecting step determines as track center if the 2 differential signal does not exceed the

prescribed reference value and outputs the resulting value.

The tracking servo performing step detects the magnitude of detrack from the 2 differential signal value.

The tracking servo performing step detects the direction of detrack from a sign of the 2 differential signal value.

In an apparatus for recording/reproducing of an optical recording medium in which a wobble signal is recorded in a track boundary plane of each sector and the 1 and 2 header having different phase is arranged in initial position of each sector, an apparatus for recording/reproducing of an optical recording medium includes: a servo error generator for detecting read channel 2 signals from electrical signals outputted in proportion to quantity of light reflected from the optical recording medium; a detrack detector for obtaining the 1 potential difference between a wobble signal detected from the read channel 2 signal and the 1 header signal and the 2 potential difference between the wobble signal and the 2 header signal, respectively, and detecting detrack from the 1 and 2 potential difference; and a tracking servo for compensating detrack detected from the detrack detector and operating a tracking actuator.

The detrack detector uses center voltage of a wobble signal detected from the read channel 2 signals.

The 1 header signal of the detrack detector is obtained by holding the peak and bottom of the read channel 2 signals detected VFO area of a header 1 field in the 1 header.

The 1 header signal of the detrack detector is obtained by holding the center of the read channel 2 signals detected VFO area of a header 1 field in the 1 header.

The 2 header signal of the detrack detector is obtained by holding the peak and bottom of the read channel 2 signals detected VFO area of a header 3 field in the 2 header.

The 2 header signal of the detrack detector is obtained by holding the center of the read channel 2 signals detected VFO area of a header 3 field in the 2 header.

The detrack detector detects the magnitude of detrack from a difference value between the 1 potential difference and the 2 potential difference, and detects the direction of detrack from a sign of the difference value.

The tracking servo compensates detrack as much as the magnitude of detrack to an opposite direction of detrack detected from the detrack detector.

The detrack detector determines as "on-track" having an optical focus in a track center if the

difference value between the 1 potential difference and the 2 potential difference does not exceed the prescribed reference value.

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

The present invention is directed to compensation of detrack by detecting a magnitude and direction of detrack by comparing potential difference between a wobble center of read channel 2 and VFO1 and VFO3 signals in the header field, staggered on the basis of track sectors.

FIG. 2 is a block diagram showing the structure of an optical disc recording/reproducing apparatus for performing detrack control method according to the present invention, in which only the principal parts related to detrack are shown.

Referring to FIG. 2, the optical disc recording/reproducing apparatus includes: a rewritable optical disc (201); an optical pickup (202) for recording/reproducing information on the optical disc (201); an error signal generator (203) for generating signals such as a RF signal and a servo error signal from electrical signals output from the optical pickup (202); a detrack detector (204) for detecting a magnitude and the direction of detrack from the read channel 2 signals of

the error signal generator (203); a servo controller (205) for generating a tracking driving signal from the magnitude and the direction of detrack detected from the detrack detector (204); and a tracking driver (206) for controlling the optical pickup (202) based on the tracking driving signal to compensate for the detrack.

Herein, the optical pickup (202) has a split photo detector for detecting the quantity of light and converting the detected quantity of light to electrical signals. The split photo detector can be divided, as shown in FIG. 3, into a predefined number of optical detecting elements, e.g., four optical detecting elements PDA, PDB, PDC and PDD in the signal track direction and the radial direction of the optical disc (201).

In the present invention as constructed above, the optical disc (201) has signal tracks made up of lands and grooves, and data can be recorded/reproduced on the tracks of both the lands and the grooves as well as either the land tracks or the groove tracks.

Also, at the track of each sector of the land and groove, for example, at the boundary surface, wobble signals having regular frequency is recorded as shown in FIG. 1. And, at the beginning position of each sector, header 1 and 2 fields and header 3 and 4 fields are staggered with respect to each other in a free format.

That is, the phases of the header 1 and 2 fields are in inverse relation with those of the header 3 and 4 fields.

Thus, while setting the optical disc (201), or during the recording/reproducing operation, the laser beam emitted from a laser diode of the optical pickup (202) is directed onto the signal tracks of the optical disc (201) and the beam reflected from the signal tracks of the optical disc (201) enters the split photo detector.

The split photo detector includes a plurality of optical detecting elements and outputs to the error signal generator (203) electrical signal proportional to the quantity of beam obtained from the respective optical detecting elements.

The optical detector, if constructed as shown in FIG. 3, outputs to the error signal generator (203) electrical signals a, b, c and d, each in proportion to the quantity of beam obtained from the respective optical detecting elements PDA, PDB, PDC and PDD.

The error signal generator (203) combines the electrical signals a, b, c and d to generate a read channel 1 signal (or an RF signal) necessary for data reading, and a read channel 2 signal for servo control, and a focus error signal, which are all necessary for a servo control. The read channel 2 signal is obtained by combining the electrical signals as (a+d)-(b+c). The

tracking error signal is obtained by processing the read channel 2 signal through filtering.

The split photo detector, if divided into two photodiodes (I1 and I2) in the direction of tracks, detects the read channel 2 signal (=I1-I2) from the beam quantity balance of both photodiodes. That is, in FIG. 3, a+d corresponds to I1 and b+c corresponds to I2.

Referring to FIG. 1, a wobble signal recorded in each track is detected only from the read channel 2.

Therefore, the present invention detects detrack using a level difference between read channel 2 signals detected at VFO1 and VFO3 areas in the header field and a wobble signal in the data area. The reason for using the signals of VFO1 and VFO3 areas lies in that the VFO1 and VFO3 areas are the longest and most stable areas in the header field and easy to detect.

For this, among the error signals detected at the error signal generator (203), read channel 2 signals are input to the detrack detector (204).

The levels of the read channel 2 signals detected at the VFO1 and VFO3 areas appear negligible due to variation of the detrack offset with focus and tracking on, as shown in Table. 1

**[Table 1]**

| Detrack[ ] | VFO1 [V] | VFO3 [V] |
|---|---|---|
| 00.00 | 0.201 | 0.183 |
| 1.00 | 0.187 | 0.194 |
| 2.00 | 0.183 | 0.190 |
| 3.00 | 0.192 | 0.185 |
| 4.08 | 0.183 | 0.197 |
| 5.00 | 0.183 | 0.201 |
| 6.00 | 0.187 | 0.206 |
| 7.00 | 0.185 | 0.185 |
| 8.00 | 0.176 | 0.181 |
| 9.00 | 0.169 | 0.187 |
| 10.00 | 0.160 | 0.171 |

FIG. 4 is a graph illustrating Table 1, in which the two signals are almost constant in level (VFO1-VFO3$\approx$0).

That is, the signal levels are constant within the range of $V_{k-} \leq VFO1+VFO3 \leq V_{k+}$ irrespective of detrack, for example, while moving the track sector.

As shown in FIGS. 5a to 5c, the center of the wobble signal (hereinafter, referred to as "wobble center") shifts up/down due to variation of the detrack offset.

Thus the quantity (=magnitude) and the direction of the detrack can be determined from comparison of the potential difference between the wobble center of the read channel 2 and the VFO1 signal (VFO1 potential - wobble center potential = Vpp1) with the potential difference

between the wobble center and the VFO3 signal (VFO3 potential - wobble center potential = Vpp2).

That is, FIGS. 5a to 5c are exemplary diagrams showing read channel 2 signals detected under variation of the detrack offset with the focus and tracking on when tilt is zero (=mechanism 0). Referring to FIGS. 5a to 5c, the signal on the above and left side is the read channel 2 signal detected at the VFO area of the header 1,2 field and, in the inverse phase, the signal on the below and right side is the read channel 2 signal detected at the VFO area of the header 3,4 field.

At this time, the wobble center shifts depending on the detrack offset and thereby a voltage $V_{WC}$ detected at the wobble center changes. Thus the voltages detected at VFO1 and VFO3 are used as reference levels.

In a case where there is no detrack, i.e., the beam is correctly focused on the track center, the potential difference between the wobble center and the VFO1 signal ($Vpp1 = V_{VFO1} - V_{WC}$) is almost equal to the potential difference between the wobble center and the VFO3 signal ($VPP2 = V_{VFO3} - V_{WC}$), as shown in FIG. 5b.

This can be expressed by Equation 1.

[Equation 1]

$$VVFO1 - VWC \approx VVFO3 - VWC$$

The value $V_{VFO1}/V_{VFO3}$ is determined while holding the peak and the bottom of the VFO1/VFO3 signal and then compared with the voltage of the wobble center. Alternatively, the value $V_{VFO1}/V_{VFO3}$ is determined while holding the center of the VFO1/VFO3 signal and then compared with the voltage of the wobble center.

According to the present invention, if the potential difference Vpp1 between the VFO1 signal and the wobble center is not equal to the potential difference Vpp2 between the VFO3 signal and the wobble center, i.e., the absolute value of the difference between the two potential differences (=Vpp1-Vpp2) exceeds a threshold $V_{Th1}$, it is determined that detrack has occurred; otherwise, the beam is determined as correctly focused on the track center, that is, "on track".

[Equation 2]

$$Vpp1 - Vpp2 \leq VTh1$$

If Equation 2 is normalized, it is expressed by Equation 3.

[Equation 3]

$$\left|\frac{Vpp\,1 - Vpp\,2}{Vpp\,1 + Vpp\,2}\right| \leq V_{Th1}$$

In a case where it is determined that detrack has occurred as the absolute value of the difference between the two potentials Vpp1 and Vpp2 is larger than the threshold VTh1, the magnitude and the direction of detrack are be detected from the absolute value and the sign of the potential difference, respectively.

If the value Vpp1 - Vpp2 is α and the absolute value of α is greater than the threshold $V_{Th1}$, the magnitude and the direction of detrack can be known from the value and the sign of α, respectively.

If the sign of α is negative (-), detrack is to be compensated by α in the positive (+) direction; otherwise, if the sign of α is positive (+), detrack is to be compensated by α in the negative (-) direction. Therefore, compensation for detrack has to be performed in such a direction as to equalize the two potential differences Vpp1 and Vpp2.

In connection with this, the detrack detector (204) outputs to the servo controller (205) detrack error signals indicating the magnitude and the direction of detrack, which correspond to the absolute value and the sign of α, respectively. The servo controller (205) converts the detrack error signals to a tracking driving signal and outputs the tracking driving signal to the tracking driver (206).

The tracking driver (206) drives a tracking actuator in the optical pickup (202) based on the tracking driving signal, i.e., moves the optical pickup (202) by the magnitude of detrack in the positive (+) or negative (-) direction such that the optical pickup (202) lies in accord with the track center line of the optical disc (201).

**[EFFECT OF THE INVENTION]**

As described above, according to an apparatus and method for recording/reproducing of optical recording medium, since the magnitude of a read channel 2 signal detected from VFO1 and VFO3 areas in header areas staggered with respect to each other from track center and having different phase is constant and a wobble center is changed, detrack is compensated by detecting the magnitude and direction of the detrack by comparing potential difference between the wobble center and VFO1 signal with potential difference between the wobble center and VFO3 signal, thereby preventing deterioration of data quality caused by detrack during a recording/reproducing operation and operating the system stably.

It will be apparent to those skilled in the art than various modifications and variations can be made in the present invention.

Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

**What is claimed is :**

1. In a method of recording/reproducing a disc arranging a plurality of sections being difference in phase for dividing shape of data area between writable data areas in which information for recognizing reference frequency is wobbled on a track and having non-writable areas repetitively/alternately and sequentially including position information of disc of the data area in each section,

a method for recording/reproducing of an optical recording medium including the steps of:

detecting a wobble signal of the data area;

obtaining a difference value between the wobble signal and a signal detected from the non-writable area and outputting the resulting value to the 1 differential signal;

obtaining a difference value between the wobble signal and a signal detected from a non-writable area having a phase different to the non-writable area;

obtaining the 2 differential signal between the 1 differential signals at the above steps;

determining as detrack if the 2 differential signal exceeds the prescribed reference value and outputting the resulting the value; and

performing a tracking servo from the resulting

value.

2. A method for recording/reproducing of an optical recording medium as claimed in claim 1, wherein the step for obtaining the 1 differential signal uses a reference clock of the non-writable area.

3. A method for recording/reproducing of an optical recording medium as claimed in claim 1, wherein the step for obtaining the 1 differential signal uses VFO area of the non-writable area.

4. A method for recording/reproducing of an optical recording medium as claimed in claim 1, wherein the step for obtaining the 1 differential signal uses read channel 2 signals generated from electrical signals outputted in proportion to quantity of light reflected from the optical recording medium.

5. A method for recording/reproducing of an optical recording medium as claimed in claim 4, wherein the step for obtaining the 1 differential signal uses center voltage of a wobble signal detected from the read channel 2 signals.

6. A method for recording/reproducing of an optical recording medium as claimed in claim 1, wherein the detrack detecting step determines as "on-track" having an optical focus in a track center if the 2 differential signal does not exceed the prescribed reference value and outputs the resulting value.

7. A method for recording/reproducing of an optical recording medium as claimed in claim 1, wherein the tracking servo performing step detects the magnitude of detrack from the 2 differential signal value.

8. A method for recording/reproducing of an optical recording medium as claimed in claim 1, wherein the tracking servo performing step detects the direction of detrack from a sign of the 2 differential signal value.

9. A method for recording/reproducing of an optical recording medium as claimed in claim 1, wherein the tracking servo performing step compensates detrack to a direction that the magnitude of the 1 differential signals obtained from the above steps is equalized.

10. In a method for recording/reproducing of an optical recording medium in which a wobble signal is

recorded in a track boundary plane of each sector and the 1 and 2 header having different phase is arranged in initial position of each sector,

a method for recording/reproducing of an optical recording medium including:

detecting a wobble signal;

obtaining a potential difference between the wobble signal and a signal detected from the 1 header and outputting the resulting value to the 1 differential signal;

obtaining a potential difference between the wobble signal and a signal detected from the 2 header and outputting the resulting value to the 1 differential signal

obtaining the 2 differential signal between the 1 differential signals at the above steps;

comparing the 2 differential signal and the detrack determining reference value and detecting detrack; and

compensating detrack detected at the above step and performing a tracking servo from the resulting value.

11. A method for recording/reproducing of an optical recording medium as claimed in claim 10, wherein the wobble signal detecting step detects a wobble signal from read channel 2 signals generated from electrical

signals outputted in proportion to quantity of light reflected from the optical recording medium.

12. A method for recording/reproducing of an optical recording medium as claimed in claim 10, wherein the step for obtaining the 1 differential signal uses center voltage of a wobble signal detected from the read channel 2 signals.

13. A method for recording/reproducing of an optical recording medium as claimed in claim 10, wherein the signal detected from the 1 header at the above step is read channel 2 signals detected from VFO area of a header 1 field in the 1 header.

14. A method for recording/reproducing of an optical recording medium as claimed in claim 10, wherein the signal detected from the 2 header at the above step is read channel 2 signals detected from VFO area of a header 3 field in the 2 header.

15. A method for recording/reproducing of an optical recording medium as claimed in claim 13 or 14, wherein the step for obtaining the 1 differential signal holds the peak and bottom of read channel 2 signals

detected from the corresponding VFO area and obtains the potential in the area and obtains the potential difference between the potential value and voltage of a wobble center.

16. A method for recording/reproducing of an optical recording medium as claimed in claim 13 or 14, wherein the step for obtaining the 1 differential signal holds the center of read channel 2 signals detected from the corresponding VFO area and obtains the potential in the area and obtains the potential difference between the potential value and voltage of a wobble center.

17. A method for recording/reproducing of an optical recording medium as claimed in claim 10, wherein the detrack detecting step determines as "on-track" having an optical focus in a track center if the 2 differential signal does not exceed the prescribed reference value.

18. A method for recording/reproducing of an optical recording medium as claimed in claim 10, wherein the detrack detecting step detects the magnitude of detrack from the 2 differential signal value.

19. A method for recording/reproducing of an optical recording medium as claimed in claim 10, wherein

the detrack detecting step detects the direction of detrack from a sign of the 2 differential signal value.

20. A method for recording/reproducing of an optical recording medium as claimed in claim 18 or 19, wherein the tracking servo performing step compensates detrack as much as the magnitude of detrack to an opposite direction of the detected detrack.

21. In an apparatus for recording/reproducing of an optical recording medium in which a wobble signal is recorded in a track boundary plane of each sector and the 1 and 2 header having different phase is arranged in initial position of each sector,

an apparatus for recording/reproducing of an optical recording medium including:

a servo error generator for detecting read channel 2 signals from electrical signals outputted in proportion to quantity of light reflected from the optical recording medium;

a detrack detector for obtaining the 1 potential difference between a wobble signal detected from the read channel 2 signal and the 1 header signal and the 2 potential difference between the wobble signal and the 2 header signal, respectively, and detecting detrack from

the 1 and 2 potential difference; and

a tracking servo for compensating detrack detected from the detrack detector and operating a tracking actuator.

22. An apparatus for recording/reproducing of an optical recording medium as claimed in claim 21, wherein the detrack detector uses center voltage of a wobble signal detected from the read channel 2 signals.

23. An apparatus for recording/reproducing of an optical recording medium as claimed in claim 21, wherein the 1 header signal of the detrack detector is obtained by holding the peak and bottom of the read channel 2 signals detected VFO area of a header 1 field in the 1 header.

24. An apparatus for recording/reproducing of an optical recording medium as claimed in claim 21, wherein the 1 header signal of the detrack detector is obtained by holding the center of the read channel 2 signals detected VFO area of a header 1 field in the 1 header.

25. An apparatus for recording/reproducing of an optical recording medium as claimed in claim 21, wherein the 2 header signal of the detrack detector is obtained by

holding the peak and bottom of the read channel 2 signals detected VFO area of a header 3 field in the 2 header.

26. An apparatus for recording/reproducing of an optical recording medium as claimed in claim 21, wherein the 2 header signal of the detrack detector is obtained by holding the center of the read channel 2 signals detected VFO area of a header 3 field in the 2 header.

27. An apparatus for recording/reproducing of an optical recording medium as claimed in claim 21, wherein the detrack detector detects the magnitude of detrack from a difference value between the 1 potential difference and the 2 potential difference, and detects the direction of detrack from a sign of the difference value.

28. An apparatus for recording/reproducing of an optical recording medium as claimed in claim 27, wherein the tracking servo compensates detrack as much as the magnitude of detrack to an opposite direction of detrack detected from the detrack detector.

29. An apparatus for recording/reproducing of an optical recording medium as claimed in claim 21, wherein the detrack detector determines as "on-track" having an

optical focus in a track center if the difference value between the 1 potential difference and the 2 potential difference does not exceed the prescribed reference value.

30. In a method for recording/reproducing of an optical recording medium,

a method for recording/reproducing of an optical recording medium including the steps of:

comparing read channel 2 signals detected from VFO1 and VFO3 areas among header areas having different phase and staggered with respect to each other from the track center and a wobble center signal;

detecting the magnitude and direction of detrack based on the comparing result; and

compensating detrack based on the resulting value.

31. A method for recording/reproducing of an optical recording medium as claimed in claim 30, wherein the comparing step compares potential difference between the wobble center and VFO1 signal with the wobble center and VFO3 signal.

<도면부분>

groove sector

land sector

header 1,2,3,4 field

203 : RF and servo error generator

204 : detrack detector

205 : servo controller

206 : tracking operator

detrack error

tilt, detrack offset, defocus offset

FIG. 1

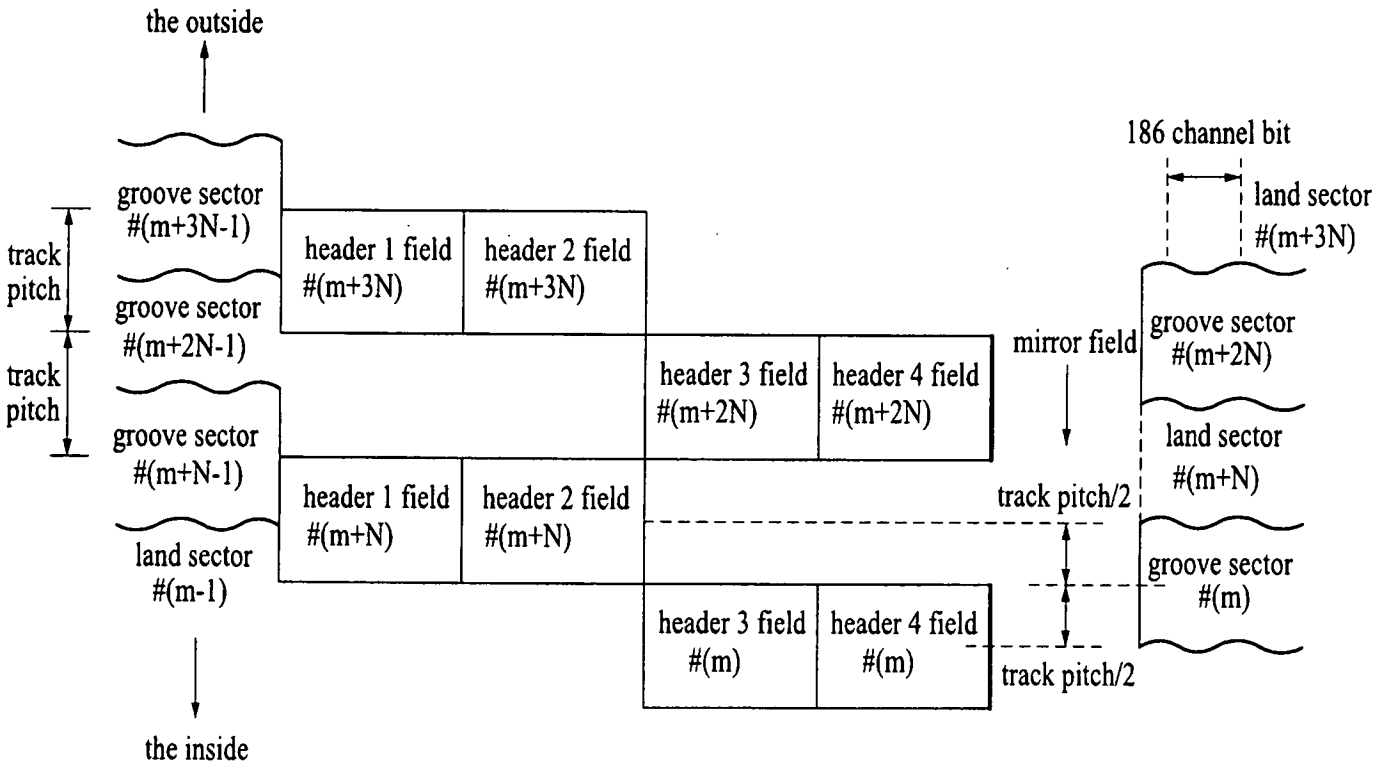

the outside
groove sector #(m+3N-1)
groove sector #(m+2N-1)
groove sector #(m+N-1)
land sector #(m-1)
the inside
track pitch
track pitch
header 1 field #(m+3N)
header 2 field #(m+3N)
header 3 field #(m+2N)
header 4 field #(m+2N)
header 1 field #(m+N)
header 2 field #(m+N)
header 3 field #(m)
header 4 field #(m)
mirror field
track pitch/2
track pitch/2
186 channel bit
land sector #(m+3N)
groove sector #(m+2N)
land sector #(m+N)
groove sector #(m)

FIG. 2

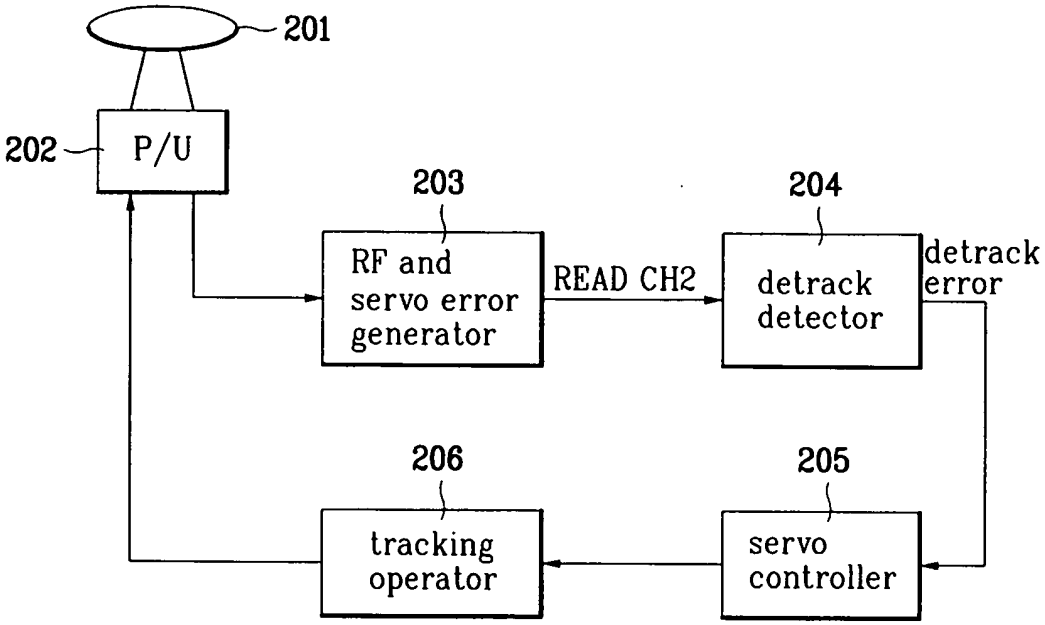

201
202
P/U
203
RF and servo error generator
READ CH2
204
detrack detector
detrack error
206
tracking operator
205
servo controller

FIG. 3

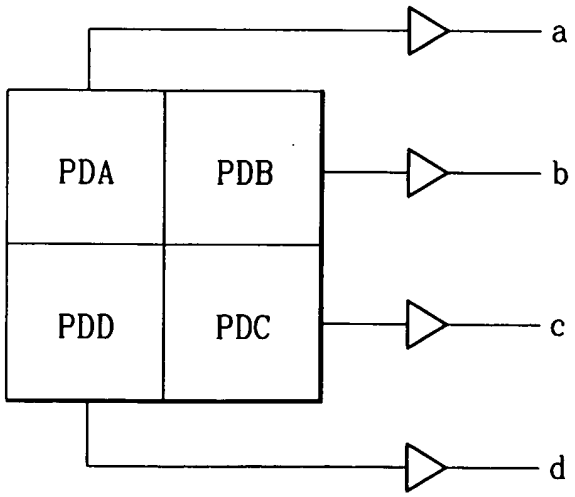

a
PDA
PDB
b
PDD
PDC
c
d

FIG. 4

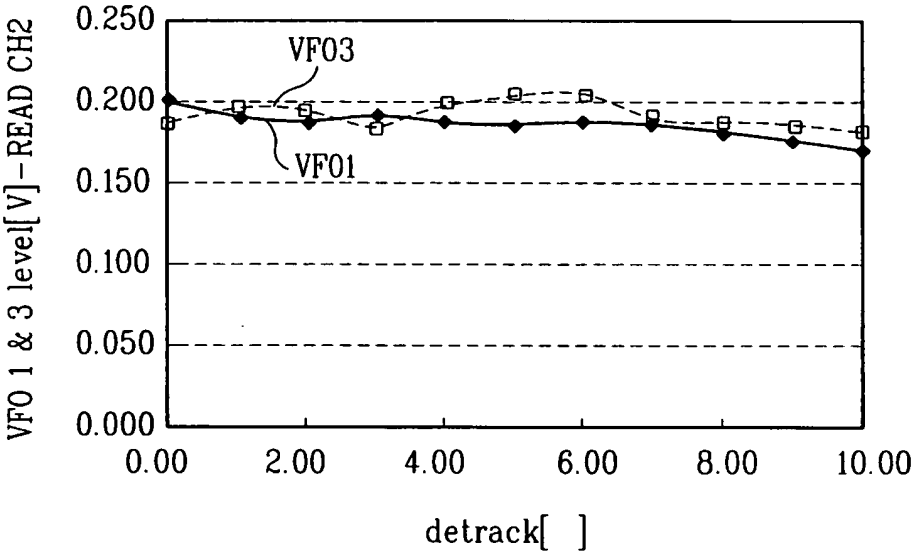
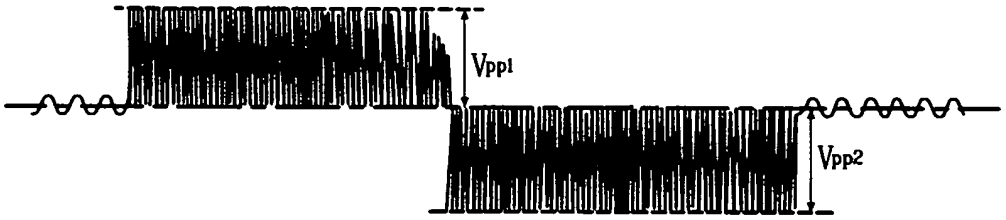

VFO 1 & 3 level[V]-READ CH2
0.250
0.200
0.150
0.100
0.050
0.000
VF03
VF01
0.00
2.00
4.00
6.00
8.00
10.00
detrack[ ]

FIG. 5a


tilt=0, detrack offset=0
defocus offset=4.08

FIG. 5b




tilt=0, detrack offset=4.97
defocus offset=4.08

FIG. 5c


tilt=0, detrack offset=10
defocus offset=4.08